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ABSTRACT

This instructional package suggests objectives, activities, and evaluation methods for use in an elementary school minicourse on energy. Objectives are to help students become aware of the present energy situation and to make more intelligent energy-related decisions in the future. Activities involve language arts, science, math, social studies, art, music, and drama. A period of several weeks is required to complete all suggested activities and evaluation procedures. The document is presented in seven major sections. Section I introduces the unit. Section II outlines major topics--alteration of lifestyles, energy conservation, population pressures, priorities for energy use, and new sources of energy. Section III lists objectives. Section IV describes pre-assessment activities. Section VI (the bulk of the document) describes a variety of learning activities including group projects, creating an energy information center, planning an energy fair, working on art projects, surveying friends and family regarding energy use, drawing energy-use time lines, and calculating energy consumption of various household appliances. Section VI suggests evaluation methods including observation and self-assessment through discussion. The final section lists materials and reading assignments required for various activities. The document concludes with an appendix containing a student evaluation log, a participation chart, and background information on energy. A bibliography is also included. (DB)

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# ENERGY AWARENESS RESOURCE UNIT FOR INTERMEDIATE GRADES

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ABSTRACT

A complete instructional package is presented for a unit on energy education for students in the intermediate grades. Included are objectives, preassessment, activities (language, science, math, social studies, art, music, and drama), and evaluation. The unit, which will cover a period of several weeks, is designed to make students aware of our present energy situation and give them information on which to base choices in the future.

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# INTRODUCTION

Children today are facing an unwanted revolution that will bring about a change in their lifestyle for many years. They will have to soon make choices on an individual scale regarding conservation of energy that will affect them on a national basis.

This unit is designed for the middle elementary grades and will cover a period of several weeks. It involves energy awareness activities integrated into science, social studies, language, mathematics, art music and drama.

TOPIC OUTLINE

THE KEY TO ACCURATE ESTIMATES OF TOMORROW'S NEEDS

IS A CLEAR UNDERSTANDING OF TODAY'S

SUPPLY AND DEMAND OF ENERGY

I Attitudes and lifestyles will have to be altered to conserve energy and eliminate waste of natural resources.

a. As the population increases, competition for energy and other natural resources will increase while supplies of those resources will decrease.

b. We need to establish priorities for the use of scarce energy.

II Mankind will have to cooperate to wisely use present sources and create new sources of energy.

a. Natural resources are not evenly distributed among nations. World-wide distribution will depend on cooperation among countries.

b. Research and development will lead to new sources of energy.

# MAIN IDEAS

A. We use many natural resources to produce energy to heat our homes, run our factories and power our automobilies.

B. The U.S. has 1/16 of the world's pupulation and uses 1/3 of the world's energy.

C. There are many things individuals can do to reduce the loss of energy.

D Energy is so basic that nothing moves or is accomplished without it.

E. The use of oil energy doubles every ten years.

F. Energy is essential in the maintenance of our society as we know it.

G. We will use more energy in the 1980's than in the history of mankind.

H. There are difficult decisions to be made on evergy development in our country and abroad.

I. The production and distribution of energy have enviromental and economic consequences.

J. We must identify current energy resources.

K. Developing countries are competing for the same natural resources.

L. The federal government and industries are investing large amounts of money to develop solar, wind, fission, fusion, geothermal, and tidal evergy resources.

M. At the rate our resources are being consumed, they cannot be replaced within our lifetimes.

N. Foreign oil imports supply about half of our oil needs.

O. When our natural resources are gone, they are gone forever.

P. We are heavily dependent on oil in almost every phase of our life.

Q. The U.S. is going to run out of oil very soon.

R. Conservation will save us money.

S. We must conserve our natural resources in order to have time for new developments in energy.

T. Each generation requires more energy.

U. Our lifestyle will have to change to enable us to conserve energy.

V. Almost any form of energy can be converted into almost any other form.

W. Energy conservation can be effectively achieved through higher energy prices.

## GENERAL OBJECTIVES

As a result of studying the energy impact on our environment, students should be able to:

1. understand how supply and demand affect energy.
2. interpret the consequences of failing to deal with the energy crisis.
3. recognize many ways individuals can reduce their use of energy.
4. know the relationship between energy and economic problems.
5. evaluate the procedures of public policy making in the area of energy.
6. appreciate the results of scientific research in alternatives to save energy.

## SPECIFIC OBJECTIVES

As a result of exploring the energy crisis, students should be able to:

1. identify problems in our lifestyle due to the shortage of energy.
2. determine alternatives of energy production.
3. discriminate which materials make better insulators of energy.
4. construct a graph showing the cost of operating ten household appliances.
5. record data from electric and gas meters.
6. identify necessary and luxury home electrical appliances..
7. analyze energy savings related to using returnable bottles.
8. make a draftometer to test the school and home for air leakage.
9. discover how energy availability will affect future lifestyles.
10. describe differences in population, energy consumption, and per capita energy consumption for geographical regions of the world.
11. conduct a survey of the community concerning their desires and needs to see if they are consistent in dealing with the energy crisis.
12. locate geographically our world-wide energy resources of fossil fuels.
13. compare how life styles have changed by interviewing people of different generations.
14. differentiate between the use of energy in children's recreation at the turn of the century, with recreational energy usage of today's youth.
15. contrast the amounts of energy involved in various types of food production and consumption through the years.

16. draw posters showing various aspects of the energy situation.

17. draw a timeline from 1800 to the present to illustrate major inventions and events related to energy.

## PREASSESSMENT

To identify and understand energy-related words, ask children to locate and circle the hidden energy words in the matrix below.(1) Discuss what each word means and develop the concept that energy is so basic that nothing moves or is accomplished without it.

Elicit from the class another list of 15-20 energy-related words and ask children who might be interested and able to develop their own hidden word matrix.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G | H | C | N | I | T | H | G | I | L |
| O | R | B | D | E | R | N | M | D | E |
| T | A | E | T | R | E | T | I | L | C |
| R | E | I | T | S | T | O | L | B | D |
| A | V | H | A | E | E | N | E | A | N |
| U | A | S | W | T | M | S | A | G | U |
| Q | S | T | O | E | K | O | C | H | O |
| F | U | E | L | O | I | L | L | C | P |
| Q | S | A | I | H | E | A | T | I | H |
| W | P | M | K | C | O | A | L | B | K |

Locate and Circle

| | | |
|---|---|---|
| KILOWATT | LITER | STEAM |
| MILE | QUART | GAS |
| KILOMETER | POUND | SAVE |
| COAL | TON | HEAT |
| FUEL OIL | COKE | LIGHT |

To examine the basic importance of energy, ask each student to select any item that they can see in their home, school, or street. Ask the student to list the kind of energy associated with the item. If it moves what energy makes it run? Does it transform energy from one kind to another? Does it store energy? What kind? What kinds of energy were used in its manufacture? What energy do you need to use it?

Some students might do some research on the "energy chain" associated with the object they chose.

Ask each student to test their "EQ" by finding the correct answer to the statements on the Energy Quotient quiz prepared by the Tennessee Valley Authority. (see Appendix, p. 35) (2)

Other "energy words for the day" and phrases to know are:

black-out
British Thermal Unit (B.T.U.)
brown-out
coal conversion
electricity
energy efficiency ratio
energy intensive
fossil fuels
fuel
gasification
geothermal energy
heating oil
hydro-electric
insulation
strip mining
liquification
natural gas
nuclear energy
off shore drilling
OPEC
petrochemical
petroleum
plutonium
power
primary source
secondary source
shale oil
solar energy

## MOTIVATION

A piece of candy may be used to introduce the unit on energy. Hold up candy and ask: What would happen if I took a bite out of this candy, then I took another bite and another? Allow plenty of time for the children to use various terms for the concept. Additional questions may be asked: What would happen if I ate all of the candy? Suppose this were not candy, but represented something else - something you would not want to eat, but something you use all the time. Suppose this were a piece of coal, oil, or gas. How would I make sure I would have some left for tomorrow? (Use it more slowly) Can anyone think of words that mean to make something last longer? Introduce the word Conserve.

By conserving energy today, we are helping to insure that we will have enough for the years ahead. The oil embargo crisis of 1973-74 brought into focus what experts had already recognized as a serious energy problem. Fossil fuels are not like the wind or water, or the sun. Each of these energy sources can be used over and over again. We will have to turn to these forms of energy later, but right now we will have to conserve what energy we have until we can find ways of using something for energy.

Continue the lesson by holding up a toy car. Ask: How can I get this car across the room? What do I have inside me that gives me the strength to push the car? What do my muscles need to give me strength? Can we call this body energy? Write the word energy on the chalkboard and allow the children time to think about things they do that requires body energy. Let them think of some ways energy is used in the classroom other than through the use of your body.

The students should be able to verbalize energy as having the capacity to move, heat, and light things. When energy is used to create heat, light, or motion it is called kinetic energy. When it is stored- in coal or food for example- it is called potential energy.

Distribute the comic books "Mickey Mouse and Goofy Explore Energy Conservation" and "Mickey Mouse and Goofy Explore Energy". Allow time during the day for reading and continued discussion on kinds of energy. (3)

View the filmstrip, "The Economics of the Energy Problem" (4) and the film "Energy-The American Experirnce." (5)

## PLANNING

Allow the children to choose one or more of the following groups on which they would like to work.

Energy information center- to provide data on conservation, supply, and demand, and research dealing with energy needs.

Evaluation charts- to be designed by the children to evaluate their participation in the unit.

Design and make the "Energy Saver" certificates- that each child will get (along with his or her picture in the local paper) after completing the unit.

Design and make bulletin boards- using pictures, articles, and clippings from magazines and newspapers.

Make a checklist for the individuals energy logs- to keep a record of "What I Did Today to Conserve Energy" They can also make a folder for everyone in which to keep the log.

Compile a list of topics- that they would like to study or research during the unit, and find resource people that they would like to invite to come to the school.

Edit the newspaper article- about the unit they are studying.

Plan an energy fair- for the school and display their projects and work. Invite friends and parents.

Plan and organize a school-or-community wide energy conservation project- such as SAVE-A-WATT-WEEK and run off copies of energy saving tips to distribute at school, the public library, supermarkets, etc.

## LANGUAGE ACTIVITIES

1. Have students bring to class pictures from catalogs and magazines of things that need electricity. Put these pictures into two groups: those that their family needs and those "extras" that they want.

Discuss with the students the idea of necessities (needs) and luxuries (wants). After they have classified their pictures, have the students choose ten electrical items that they feel are necessary to maintain their lifestyle. (Those they can't do without.) Have the students make a collage or mobile of the ten necessities. Of these ten choose the three most important. Defend the choices.

2. Divide the class into groups. Ask each group to list the characteristics of a life style that they would find most satisfying.

Now ask the students to imagine that due to a shortage, gasoline will be permanently rationed to five gallons per week. Discuss how this would affect the possibility of living the "good life" as previously discussed. What other inconveniences would you have?

Ask them to design a life style which would fall within five gallons of gasoline ration.

3. Have students use questions to survey their friends, business people, and leaders in the community. Discuss findings to see if they are consistent with existing needs of society to deal with the energy crisis. The children should assist in formulating the questions.

1. Do you plan to buy a new car soon? Why? What are the qualities you would want in a new car?
2. What appliances do you plan to buy in the near future? What will you consider?

3. What do you think is a comfortable temperature in your home? Do you try to maintain this temperature?

4. Have you reduced the amount of gasoline for driving? How?

5. Do you think there is a fuel shortage? Why?

6. Do you think your utility bills are reasonable? Why?

After compiling, presenting, and discussing the findings attempt to draw some conclusions concerning the type of information and approach needed to arouse the public awareness of the problem considered.

4. Interview someone who is old enough (grandparents, if available) to remember what life was like before the days of many automobiles, plastic, television, and electric appliances. Ask this person the type of questions as follows, or others you feel that are interesting.

1. How did you heat your home?_____
2. What did a workweek consist of in days and hours?_____
3. How did you get to work?_____
4. How did you get to school?_____
5. Did your family own a car?_____ How much did it cost?____
6. What kinds of entertainment did you enjoy?_____
7. How did you heat water?_____
8. What were the eating facilities like in your school?_____
   The bathrooms?_____ water fountains?_____

5. Report on the gas rationing program during World War II. Tell how it worked. What were the major problems? What were the costs of administering the program? How does the situation differ today? Allow the children to decide how they want to present these reports.

6. Some children may want to explore and report on the possible environmental consequences of a full-scale fuel discovery and production program.

7. Draw a timeline from 1800 to the present to illustrate major inventions and events related to energy. (Some of the children could do the research and some could help in the art work.)

## SCIENCE ACTIVITIES

1. Have children bring fruit juice cans and insulating materials or use materials in the classroom. Introduce by asking: What is insulation? Which materials are better insulators? Perform the following experiments to determine insulating properties.

Divide the class into groups. Each group will obtain a fruit juice can and insulating materials they will use.

Group 1: No insulating material
Group 2: Paint outside of can black
Group 3: Styrofoam packaging material of measured thickness on outside of can.
Group 4: Newspapers, same thickness as styrofoam.

Additional groups can choose other insulating materials same thickness as styrofoam such as cloth, plastic, etc.

Each group prepares their juice cans. Place an ice cube in each can. Place all cans in the sun. Check the ice cubes at fifteen minute intervals until the first ice cube is melted. Continue to check until all ice cubes are melted. Record the time it takes to melt each ice cube.

Alternate: Place thermometers in water in cans. Measure rate of temperature rise.

Discussion: How did the black paint affect the insulating qualities of the can? Which material served as the best insulator? The poorest? How can this knowledge be used to conserve our energy supplies? Should builders be required to insulate homes and other buildings? Ask each student to check for insulation around the school and homes.

2. Make a draftometer by following these instructions: Cut a 12cm by 25cm strip of plastic food wrap. Tape it to the pencil. Blow the plastic gently and see how freely it responds to air movement. (6)

Test the school for air leakage and around the edges of windows of various places for loss of energy.

3. Have students record data while they take a bath. Fill the bathtub as usual. Before bathing, measure the depth of the water in inches. When it's time to bathe again, take a shower. Before you begin the shower, close the bathtub drain so that your shower water will collect in the tub. After taking your shower, measure the depth of water collected in the tub. Compare this depth with your bath water depth. Which used less hot water? By how much? Discussion: How can hot water be saved?

4. Engage children in the class in lifting or pushing several of the objects in the classroom such as books, erasers, chalk, chairs, objects, and so forth. Help children understand that in all of these lifting and pushing activities work was being done and energy was provided by their muscles and from the food they eat.

As homework, ask each child to bring in several pictures from magazines that show work being done by machines or people. Analyze the pictures according to the energy source that is responsible for the motion. Organize the pictures into a wall or bulletin board display. What sources of energy seem to be most prominent in our society?

MATH ACTIVITIES

1. Each student will choose 10 appliances used in their home, order these appliances from most costly to least costly and place on the graph below. Discuss mills and the construction of the graph.

The TABLE OF COST OF ELECTRICITY FOR ONE HOUR OF USE that will be used in this activity. (7)

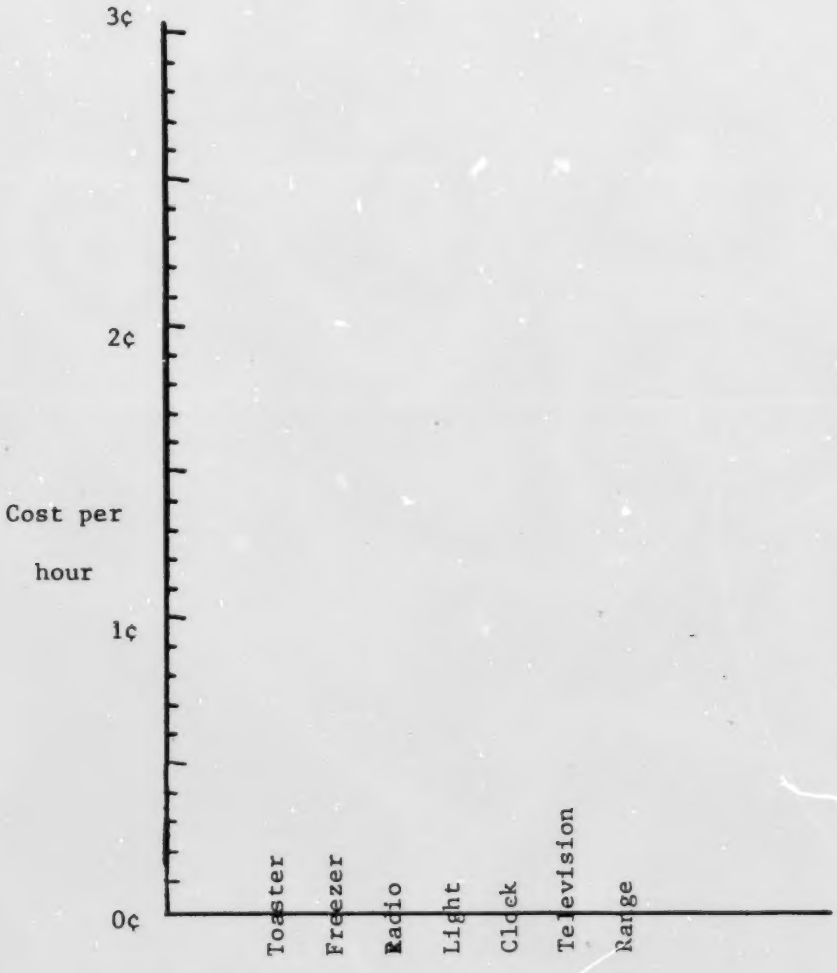


TABLE OF COST OF ELECTRICITY FOR ONE HOUR OF USE (7)

| | | |
|---|---|---|
| 1. | Toothbrush | $ .0002 (.02 of a cent) |
| 2. | Toaster | .04 |
| 3. | Hot Water Heater: | |
| | Tub Bath | .09-.14 |
| | Shower | .07-.115 |
| | Automatic Washer | .17 |
| | Dishes by Hand | .02 |
| | Dishwasher | .09-.14 |
| 4. | Freezer | .005 (½ cent) |
| 5. | Lights: | |
| | Incandescent - 100 watt | .0038 |
| | Fluorescent - 40 watt tube | .0019 |
| 6. | Record Player | .004 |
| 7. | Air Conditioning | .038 |
| 8. | Radio | .002 |
| 9. | Television: | |
| | Black and White: | |
| | Solid State | .002 |
| | Tube | .006 |
| | Color: | |
| | Solid State | .007 |
| | Tube | .01 |
| 10. | Range: | |
| | Large Burner | .038 |
| | Small Burner | .02 |
| | Bake | .02 |
| | Broil | .13 |
| 11. | Dishwasher | .045 |
| | Hot water | .14 |
| 12. | Refrigerator/Freezer - 14 cu/ft: | |
| | Frostless | .008 |
| | Manual | .005 |
| 13. | "Radar" Range - Microwave Oven | .05 |
| 14. | Clock | .007 |

At home have each child share the chart with his family and ways the family could conserve electricity.

Find the cost of operating other appliances used by the family.

Related activities:

1. What does it cost to watch TV for one day? One week?

2. How much could be saved by washing dishes by hand instead of using the dishwasher?

3. How much would you save by taking a shower instead of a tub bath?

4. What kind of lighting is more economical to use? Why?

2. Demonstration electric meters are often available from the local electric company. Cardboard models of electric and gas meters can be made by the children, and then they can practice reading a variety of meter settings individually or in a group. A power company representative may come and show the children how this is done. Ask students to read the gas or electric meters in their homes. Tell them that they will be reading the meters exactly one week later to determine how much electricity they will be using in one week. Record the data for each family on a classroom chart.

Urge each child to discuss with his family about saving, especially during the "energy-saving-week" at school. Read the meter the next week. What family saved the most? What was the average saving? How were they successful in saving? Was it hard? etc.

3. Involve the class in some mathematical computation. How much energy equivalent in gasoline will each family represented in the class save if they purchase two six-packs of returnable bottles each week for one year? How many miles of automobile travel are possible? How much money is saved? (The purchase of a six-pack of soft drinks in returnable bottles instead of no-deposit, no return containers will save the energy equivalent of 1½ pints of gasoline. This can take the average family car about 2½ miles.) Empty bottles are returned for 60-cent deposit...the six-pack purchase will have cost 30 cents less than for throwaways.

4. Have the children locate in different geographic regions of the world, the different resources of oil, coal, and natural gas. On a map of the world, locate thes energy resources using different

colored pins for each fuel. Decide which countries have the most reserves and construct a bar graph indicating which countries have the greatest demand for these fuels. Discuss what problems result in this supply/demand inbalance. (See appendix, page 36) (8)

## SOCIAL STUDIES ACTIVITIES

1. Collect local newspapers for one week. Divide pages among the children and ask them to cut out any article and/or advertisement that is energy-related. Make a bulletin board display of this week's energy news. Assign studentsto go to a local newspaper office and ask to review the newspapers printed the same week ten years ago. Have them write the headings of articles and advertisements related to energy at that time. Compare the number of energy articles printed for the two weeks. Compare the energy concerns.

Ask the students to write a short energy article describing what they would predict the energy concerns will be 10 years from now.

Complete the bulletin board display showing "energy news" for the 30-year span.

2. Ask students to write a summary report of their last family vacation or outing. Where did they go? What did they see? How many miles did you travel?

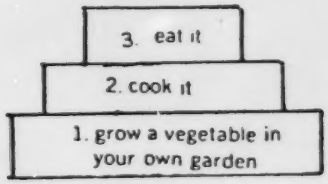
Allow the children to discover some ways to have a good vacation and save energy. Encourage them to come up with some slogans or advertisements such as, Vacation at home...Discover nearby attractions...Take a train... Rediscover walking, hiking, bicycling... Survey the area for interesting things to see and do. Plan a vacation.

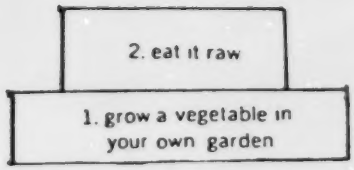
3. Draw pyramids illustrating the "energy steps" required in various types of food production and consumption. Allow them to fill in some of the various steps. Emphasize the fact that if we use things as close to the way nature makes or uses them, we are probably saving energy. (9)

Keep a daily log for one week of the number of energy steps used in each of their families' total vegetable consumption. Include salads, frozen and canned vegetables, etc. Compare class results. Why would the season make any difference in the amount of energy steps?

12. eat it
11. throw away package
10. thaw it & cook it
9. take home & put in freezer
8. you drive to market to buy it
7. market keeps it frozen
6. refrigerated truck takes it to market
5. it is frozen
4. it is packaged
3. it is sliced by machine
2. transports it to a processing plant
1. someone else grows a vegetable

6. eat it
5. take it home and cook it
4. you drive to market and buy it
3. refrigerates it at the market
2. transports it to market
1. someone else grows a vegetable



## ART ACTIVITIES

1. Ask the children to interview someone who is very old. Find out the kind of games they played, what their favorite toys were, and what kind of family recreation they enjoyed when they were about the same age as your students are. Some of the people might have samples or pictures of recreation that was popular during the late 1800's/early 1900's.

Conduct a class survey and make a list of the popular things. Divide the class into two groups, and ask one group to make a mural of "Yesteryouth Recreation" and the other group will construct a mural of "Today's Youth Recreation". When they are completed, discuss the kinds of energy used by both groups. (10)

2. Make posters and bulletin boards displaying various aspects of the energy situation. Arrange to whow these in the school, and public buildings, retail stores and other places in the community.

3. Draw cartoons on the energy shortage for publication in the local school and/or local newspapers. They can be humorous.

## MUSIC ACTIVITIES

Children might enjoy learning to sing some of the songs from "Yesteryouth" while they are involved in the mural on recreation.

In addition to these, they will enjoy "The Environment." (11)

## DRAMA ACTIVITIES

Have children play the charades game with an energy theme. Pantomine the area of time (past, present, or future) for this activity. Have others guess what is being done, and what time period is involved.

## CULMINATING ACTIVITIES

1. Divide the class into groups of five with each group representing a "family" of five: father, mother and three children. Announce to all groups that because of a very critical shortage of energy the winter heat available to each family is being reduced by 20 percent.

Challenge each group to prepare the best list they can of how they will deal with the situation. What can be done by the father? mother? children? How can they remain comfortable?

2. Show the filmstrip: "Energy-Use It Wisely Around The Home". (12) Review with the class the simple but very important concept that people can save energy by not wasting things. Develop with the class a list of things that are often wasted in their homes. Ask each child to make a chart of to record daily energy related activities for one week. Suggest that the children give themselves a plus every time they turn out a light that is not needed, close the refrigerator door more quickly, etc. At the end of the week discuss where pupils saved energy most often.

3. Arrange field trips for students to see and learn firsthand about:

a. utility companies
b. power plants
c. city dump
d. solar heated home or building
f. recycling center
g. building under construction to see insulation, etc.

Some other culminating activities that children might enjoy as a group are

1. Form an energy conservation task force to explore ways to save energy in the school, in the home, and in the community. Set up and distribute guidelines based on the findings.

2. Set up several debate teams to research and argue the following:
   offshore drilling versus environmental protection

   fuel rationing versus increasing prices to cut demand

   voluntary versus madatory conservation measures

   benefits of neclear reactors versus risks

3. Have a group to represent policy makers for government, for business and industry, for environmentalists, and for consumers. Ask each group to recommend at least five things it would do to:

   reduce America's dependence on foreign oil

   protect the envoronment while developing new sources of energy and increasing energy production

   reduce demand for energy and encourage conservation

   arrive at the fairest possible distribution of limited fuel supplies

Some individual activities are:

1. Research and report on expected future sources of energy and the advantages of each. Include geothermal power, nuclear power, shale oil, and solar energy.

2. Compare the current energy situation with previous shortages of critical commodities in the U.S. and previous shortages in other nations. How do the situations differ? How are they smiliar? What new elements need to be considered in the current situation? What can we learn from the past?

3. Make up humorous slogans on conserving energy. Let other children help in illustrating them.

4. Write essays, editorials, and short stories on the energy situation. Possible topics are:

   Why I like small cars.

   Conserving energy - the best thing that happened at home

   Car pools-a great way to enjoy friends.

   (Children will come up with some better topics than these.)

5. Now is the time to hear from the students that planned the school energy fair. Allow the other children to assist them in planning for parents and friends. How can our work be displayed? Who can help make the invitations? Form groups in order that everyone has some responsibility in this activity.

View the film, "Challenge of the Future" (13). Summarize the problems which face our nation and some options for the future.

## TEACHER EVALUATION

Continuous evaluation throughout the unit should be done by the teacher observing student's

1. participation
2. enthusiam
3. projects attempted
4. projects completed
5. questions asked
6. responses to questions

Evaluation of this unit can be done with discussion of the following questions:

1. In what ways might an energy shortage affect family life?
2. How can be expect lifestyles to change?
3. How can an energy shortage cause unemployment?
4. How would you view the energy shortage is you were:

    a. building a new house
    b. buying a new car
    c. considering a change of location to another part of the country
    d. manufacturing electric appliances
    e. the manager of a store in a shopping center

5. What are 15 things individuals can do to conserve energy?
6. What conflicts are likely to arise as we struggle to meet demands for energy and to protect the environment?
7. What six countries in the world possess the highest oil reserves?
8. What consumer's future purchasing is affected by energy? How will you decide what you are going to buy?

The teacher can have students write endings to the following:

1. The toughest energy conservation measure for me would be ...
2. Three things I would do willingly to conserve energy are....
3. To me the worst thing about an energy shortage is.....
4. If I had the authority to make laws for energy conservation, three laws I would make are.....
5. Five appliances my family and I could use less to conserve energy are.....
6. The most important thing I think government could do about energy shortage is...
7. Fuel rationing would be hardest for...
8. I think that the best source of energy to develop is_____ because...
9. The most serious consequences involved in the energy crunch are: 1_____2._____3._____

The teacher can use the "Student Participation Chart" and "Student Evaluation Log" as evaluation techniques. (Appendix)

## STUDENT EVALUATION

The students should discuss and come to a decision on the standards of behavior acceptable for the unit in the planning stage. They should help decide what is to be included on the student charts and logs.

# MATERIALS

non reading

1. a lollipop
2. toy truck or car
3. chalkboard
4. several pieces of poster paper
5. markers
6. scissors
7. fruit juice cans
8. styrofoam packaging material
9. newspapers for insulating
10. cloth " "
11. fiberglass " "
12. scotch tape
13. plastic food wrap
14. thumb tacks
15. cardboard models of electric and gas meters
16. map of the world
17. two identical bottles and two thermometers
18. colored paper
19. ice cubes
20. colored pins
21. fruit juice cans
22. black paint
23. song, "The Environment" (11)

reading

1. newspapers
2. magazines
3. catalogs
4. encyclopedias

## STUDENT EVALUATION LOG (14)

Name: _____

Date: _____

| | always | usually | seldom | never |
|---|---|---|---|---|
| I understood the directions before starting my work. | | | | |
| I work without disturbing others around me. | | | | |
| I complete a task before attempting another one. | | | | |
| I put everything back into the proper place when I finish with the materials. | | | | |
| I listen while others talk. | | | | |
| I share materials willingly. | | | | |
| I try to do my best. | | | | |
| I will help others when I am asked. | | | | |

(Through class discussion, other standards can be listed by the children.)

THINGS I PARTICIPATED IN AND CONTRIBUTED TO THE UNIT (14)

| written reports | mural | experiment | art activities | interview | books | committee work | bulletin boards | community projects | math activities | science activities | social studies | music | NAME: |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | |
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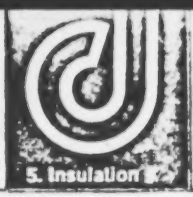
1. Clothes dryer

Lint Zephyr

2. Lint Zephyr

3. 50 percent

4. Pots & Pans


5. Insulation

more

6. More

Wasteful

7. Wasteful

8. 75 degrees

1/3

9. One-third

10. 66°

Half

9. Half

11. Rotors

12. A high EER

Caulk

EER

12. A high EER

LESS

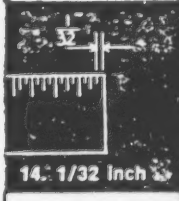
16. Less

Plas-
tic

13. Plastic

78 degrees or higher

15. 78 degrees or higher



14. 1/32 inch

effi-
cient.

17. Efficient

A tight-fitting lid

15. A tight-fitting lid

Refrigerator door

13. Refrigerator door

200 per-
cent heating efficiency

16. 200 percent heating efficiency

Use wisely

Full

filter

Wise

39

150 degrees

170 degrees

EVA

ENERGY CONSERVATION

# what's your E.Q.?

**How much do you know about energy? What's your Energy Quotient? To find out, read each statement. Find its correct answer. Then write the number of the answer in the box following the statement.**

A. Slows the movement of heat. ☐

B. Recommended home temperature in winter. ☐

C. Open and close it quickly. ☐

D. A quick shower uses _____ the water of a normal bath. ☐

E. Put it around windows and doors. ☐

F. Maximum temperature for water heater. ☐

G. Insulated drapes can block out _____ of the heat from the sun. ☐

H. Look for it on an air conditioner. ☐

I. What every cooking pan needs on top. ☐

J. Heat Pump. ☐

K. Using the range oven for a heater or toaster is a _____ use of energy. ☐

L. Should be flat-bottomed. ☐

M. Air condition at _____. ☐

N. Clean it after each dryer load. ☐

O. Solid-state appliances use _____ energy than tube types. ☐

P. Vent it to the outside. ☐

Q. Heating and cooling system _____ should be cleaned or replaced every 30 days. ☐

R. Fluorescent lights are at least _____ times more efficent than incandescent lights. ☐

S. Clothes washers and dishwashers are most efficient when washing _____ loads. ☐

T. Small appliances are _____ users of energy. ☐

World and Regional Population, Energy Consumption and Per Capita Energy Consumption (8)

| | Population (millions) | % of World's Population | Energy Consumption Q's ($10^{15}$BTU) | % of World's Consumption | Per Capita Consumption $10^{7}$BTU | % of World's Per Capita Consumption |
|---|---|---|---|---|---|---|
| North America | 231 | 6.2 | 72.68 | 35.9 | 31.5 | 586 |
| Caribbean America | 129 | 3.4 | 4.32 | 2.1 | 3.35 | 62 |
| Other America | 166 | 4.4 | 3.44 | 1.7 | 2.07 | 38 |
| Western Europe | 359 | 9.6 | 39.22 | 19.4 | 11.0 | 204 |
| Middle East | 111 | 3.0 | 2.59 | 1.3 | 2.33 | 43 |
| Far East | 1172 | 31.2 | 15.43 | 7.6 | 1.31 | 24 |
| Oceania | 22 | 0.6 | 2.54 | 1.3 | 11.5 | 213 |
| Africa | 369 | 9.8 | 3.66 | 1.8 | 0.99 | 18 |
| Communist Countries | 1194 | 31.8 | 58.70 | 29.0 | 4.91 | 91 |
| World | 3753 | 100.0 | 202.39 | 100.1 | 5.38 | 100 |

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